

The Tyranny of the Lecture



OSA Board Lunch
San Jose, CA, 17 October 2011



The Tyranny of the Lecture



@eric_mazur
#lectyr





EDUCACION

Think of something you are really good at

EDUCACION

How did you become good at what you wrote down?

EDUCACION

Became good at it by:

- 1. trial and error**
- 2. lectures**
- 3. practicing**
- 4. apprenticeship**
- 5. other**

EDUCACION







1 lecture

2 PI



1 lecture

2 PI

3 PI 2.0



1 lecture


2 PI

3 PI 2.0



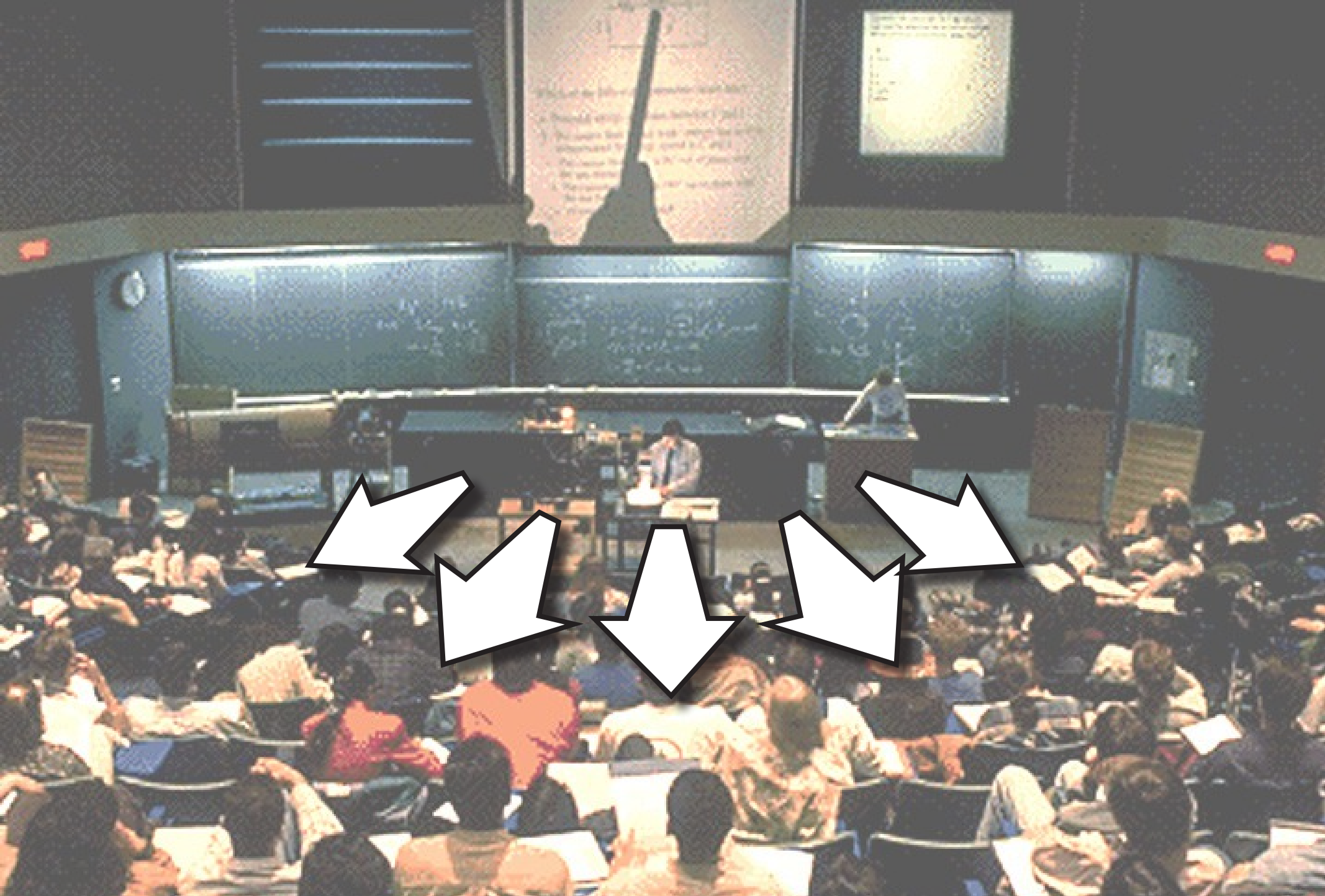






**What happens
in a lecture?**





The result?

EDUCACION

Lack of learning

EDUCACION

Lack of learning

Lack of retention





1. transfer of information



1. transfer of information

2. assimilation of that information



1. transfer of information (in class)

2. assimilation of that information



1. transfer of information (in class)

2. assimilation of that information (out of class)



**Should focus
on THIS!**

1. transfer of information (in)

2. assimilation of that information (out of class)

- 
- 1. transfer of information (in class)**
 - 2. assimilation of that information (out of class)**

- 
1. transfer of information (out of class)
 2. assimilation of that information (in class)



1. transfer of information (out of class)

2. assimilation of that information (in class)

A photograph of a man in a dark suit, white shirt, and red tie with white polka dots. He is leaning forward, looking down at a student. The student is a woman with long blonde hair tied in a ponytail, wearing a dark jacket. They are in a lecture hall with green plastic chairs and a purple carpet. Other students are visible in the background, some looking at papers. A white rectangular box with a black border is overlaid on the right side of the image, containing the word "question".

question



question



think



question



think



poll



question



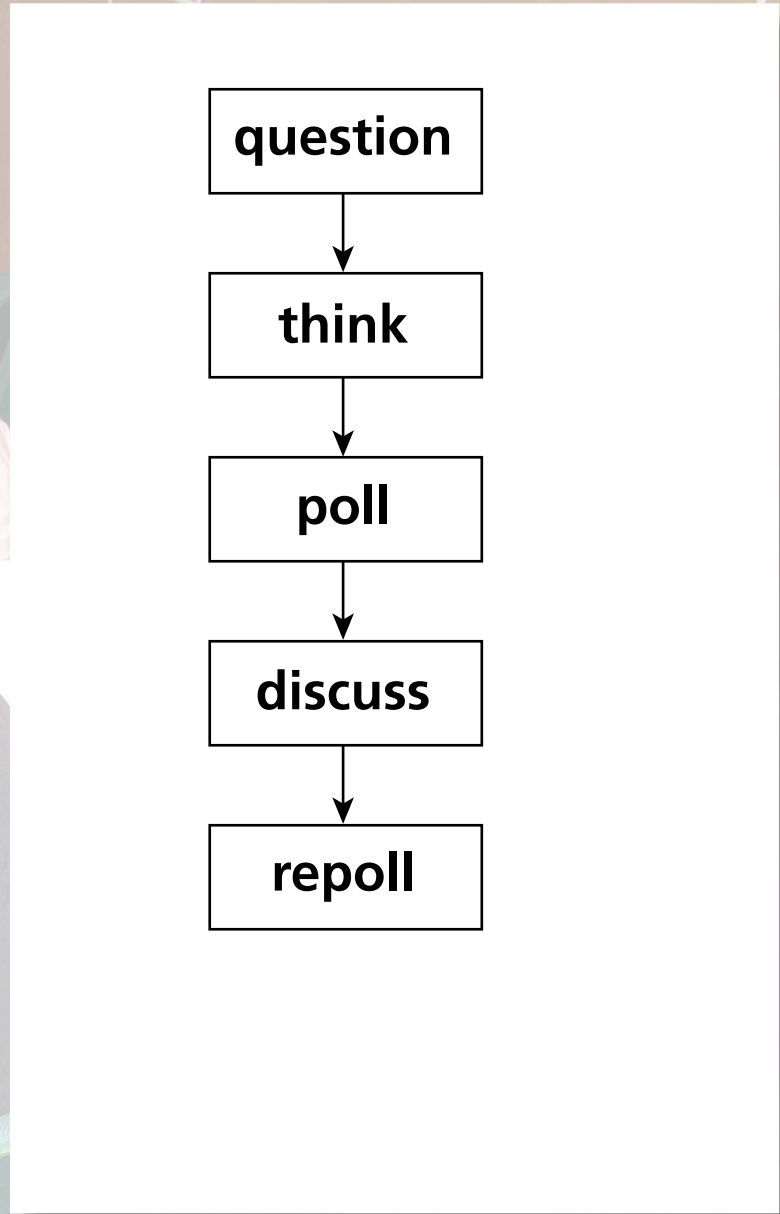
think

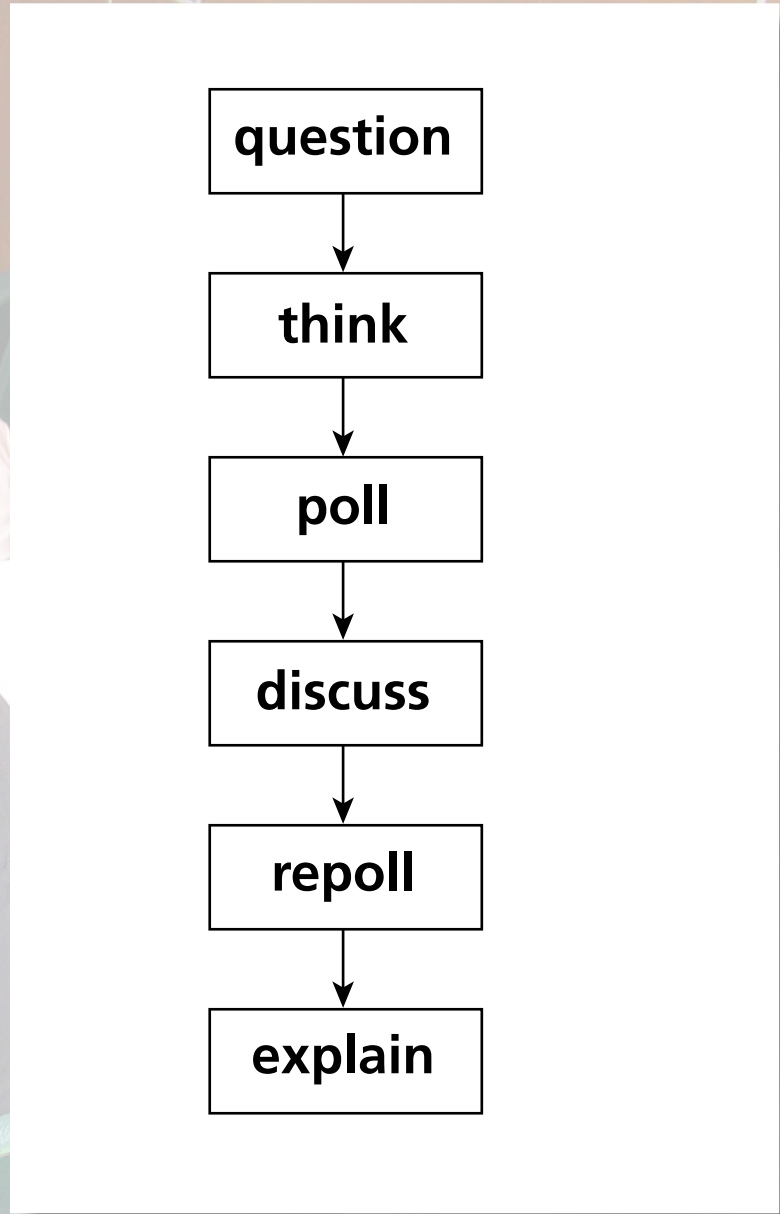


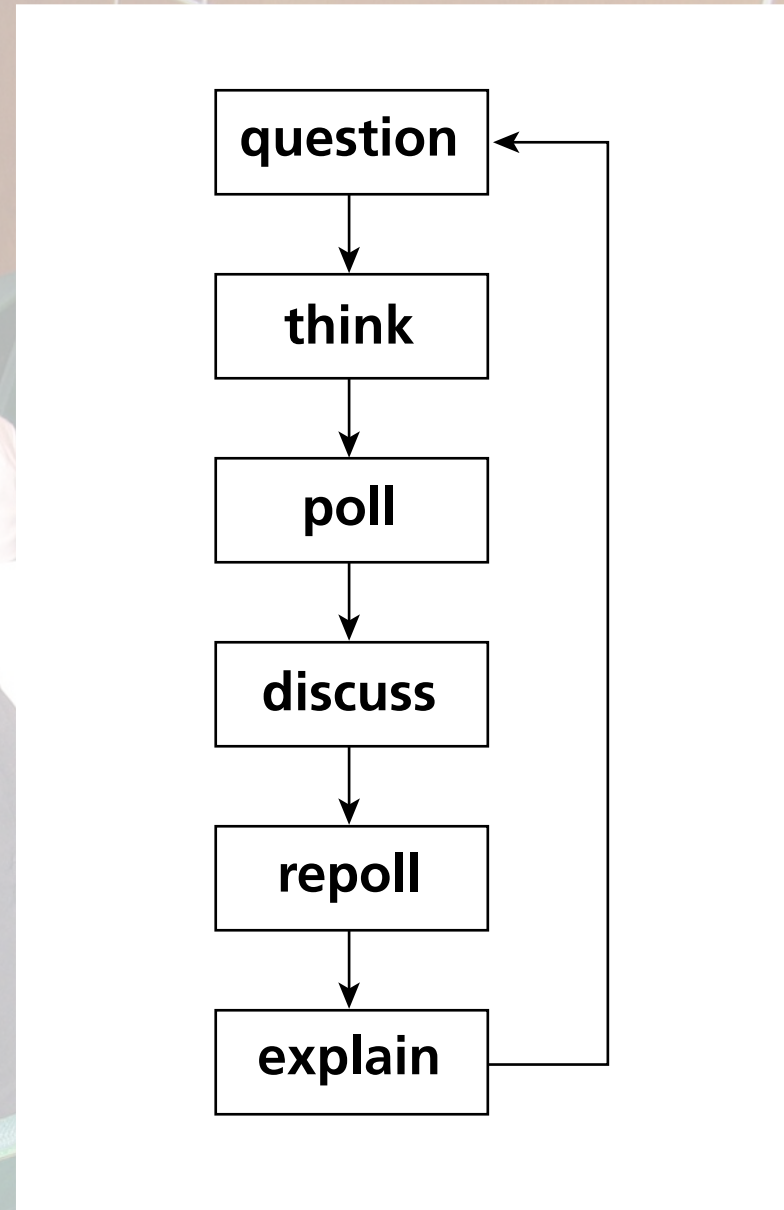
poll

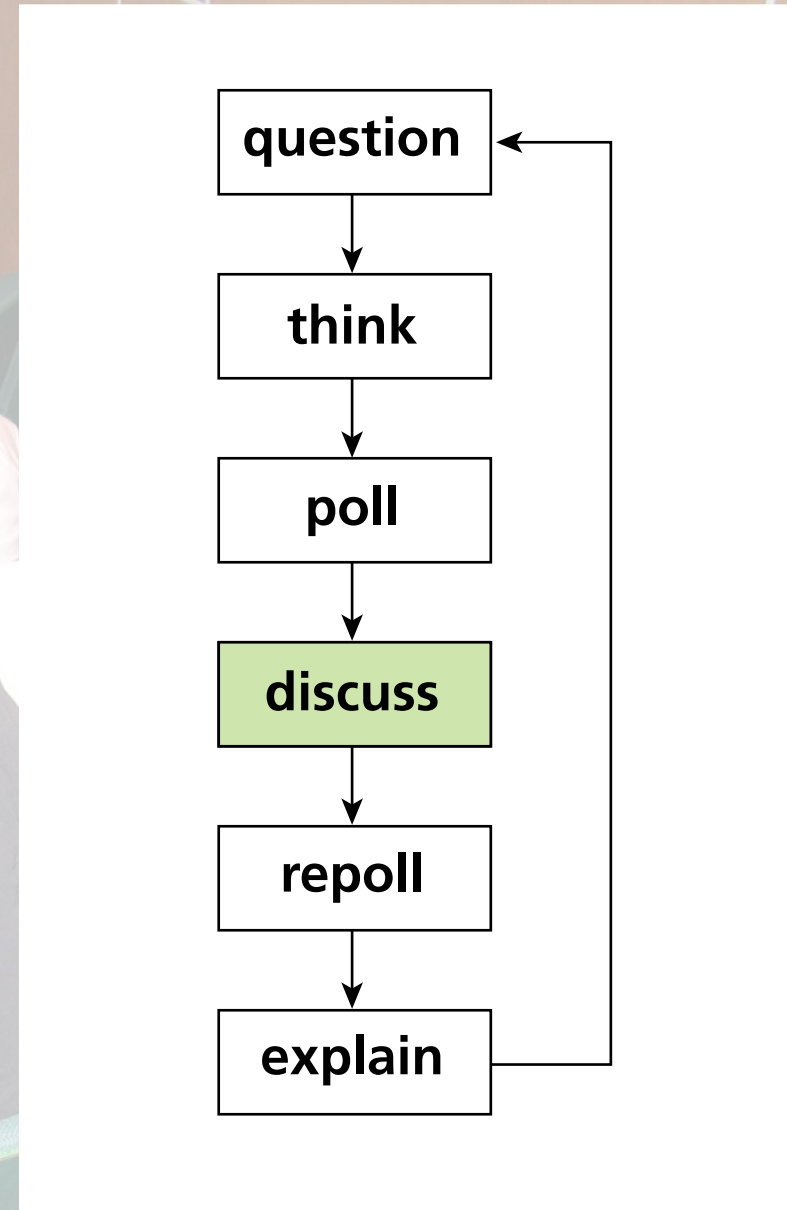


discuss







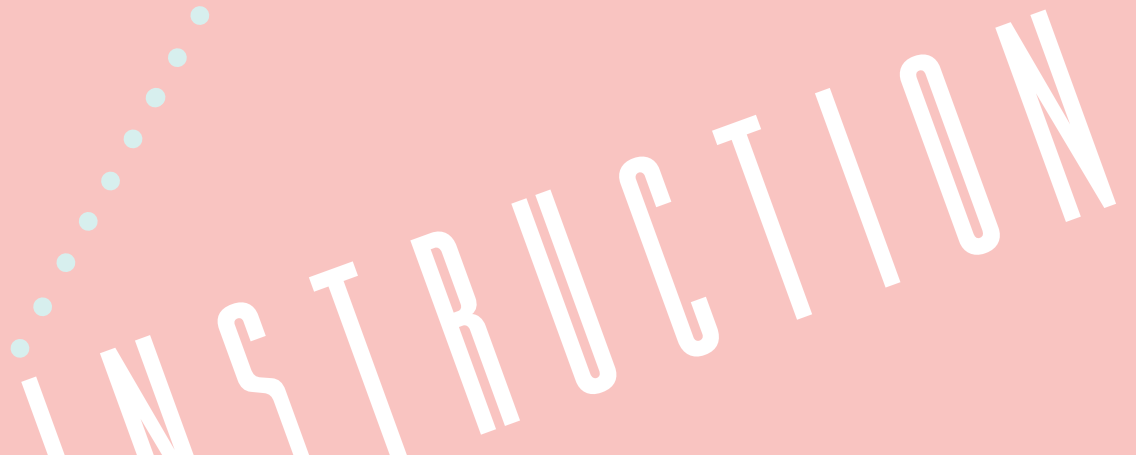


1 lecture

2 PI



Peer



INSTRUCTION

1 lecture

2 PI



Peer

Higher learning gains

INSTRUCTION

1 lecture

2 PI

The background features a large, light blue 'P' and 'I' on the left. The word 'Peer' is written in large, white, outlined letters across the top. The word 'INSTRUCTION' is written in white, outlined letters at the bottom. Two red, bold, italicized phrases, 'Higher learning gains' and 'Better retention', are positioned diagonally across the center. A dashed yellow line with arrows connects the 'P' to the 'I', passing through the red text. A dotted blue line with arrows also connects the 'P' to the 'I', passing through the red text.

Higher learning gains

Better retention

INSTRUCTION



1 lecture

2 PI

3 PI 2.0

feedback

1 lecture

2 PI

3 PI 2.0



1991

1 lecture

2 PI

3 PI 2.0



1993



1998





1 lecture

2 PI

3 PI 2.0



How do I...

- design good questions?
- optimize the discussions?
- manage time?

learning | catalytics

1 lecture

2 PI

3 PI 2.0

learning | catalytics



Gary King



Brian Lukoff



Eric Mazur

1 lecture

2 PI

3 PI 2.0

Use intelligent algorithms and data analytics to...

- **improve questioning**
- **manage discussions**

- **facilitate time management/flow**

- lowest
- a. A 30-year fixed rate mortgage at 12%
 - b. A 15-year fixed rate mortgage at 12%
 - c. A 30-year fixed rate mortgage at 12%
 - d. A 15-year fixed rate mortgage at 12%
2. The biggest factor that leads American companies to manufacture their products overseas in India is:
- a. Higher quality of craftsmanship
 - b. Lower labor costs
 - c. Decreased transportation costs
 - d. Effective legal systems
3. Which of the following correctly summarizes the accounting equation for a sole proprietorship?
- a. $\text{Assets} = \text{Liabilities} + \text{Owners' equity}$
 - b. $\text{Liabilities} = \text{Assets} + \text{Owners' equity}$
 - c. $\text{Owner's equity} = \text{Assets} + \text{Liabilities}$
 - d. $\text{Revenue} = \text{Assets} - \text{Liabilities}$
4. In order to present a business plan to a group of potential investors, a businessperson would most likely use which of the following?
- a. Powerpoint
 - b. Quickbooks
 - c. Peoplesoft
 - d. Excel
5. In order to start an online business, and individual would need all but which of the following:
- a. business model
 - b. depreciation?

extensible plug-in architecture for question types

Sample question types:

- direction
- expression
- long answer, short answer, word cloud (fill in text)
- multiple-choice, many-choice
- numerical (enter a number)
- ranking
- region (select point on image)
- sketch

Sample question types:

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optics i

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Jump to ▼

1

2

3

4

5

6

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8

9

10

11

12

13

14

15

**4.** direction Light enters horizontally into the combination of two perpendicular mirrors as shown below.[Deliver](#) [Show all results](#)

Indicate the direction of the incident light after it reflects off of both mirrors.



feedback & support

1 education**2** PI**3** PI 2.0

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optics i

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6 7 8 9 10 11 12 13 14 15

perpendicular mirrors as shown below.

[Deliver](#) [Show all results](#)

Light enters horizontally into the combination of two perpendicular mirrors as shown below. Indicate the direction of the incident light after it reflects off of both mirrors.



Submit response

[Switch to text response](#)[feedback & support](#)

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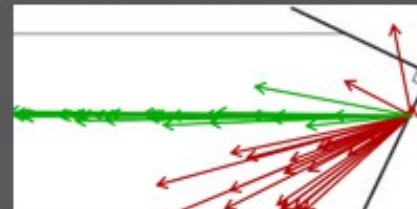
6 7 8 9 10 11 12 13 14 15

pendicular mirrors as shown below.

[Deliver](#) [Show all results](#)

Round 1

57 responses, 58% correct



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optics i

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6 7 8 9 10 11 12 13 14 15



perpendicular mirrors as shown below.

[Deliver](#) [Show all results](#)

Round 1

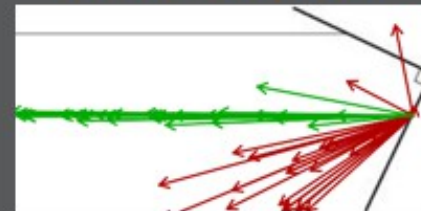


57 responses, 58% correct

Round 2



51 responses, 73% correct



✓ 8 get it now

✗ 0 still don't get it



feedback & support

Sample question types:

- direction
- expression
- long answer, short answer, word cloud (fill in text)
- multiple-choice, many-choice
- numerical (enter a number)
- ranking
- region (select point on image)
- sketch

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arlington school district

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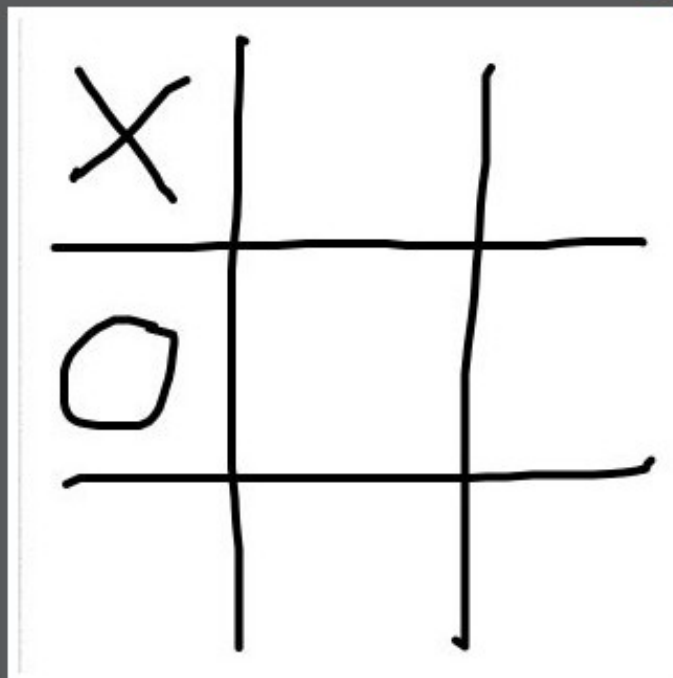
Jump to ▾

1

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4

**4.** region It's X's turn -- what's the best next move?[Stop delivery](#) [Deliver again](#) [Assign groups](#) [Show all results](#)

feedback & support

1 education**2** PI**3** PI 2.0

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arlington school district

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1

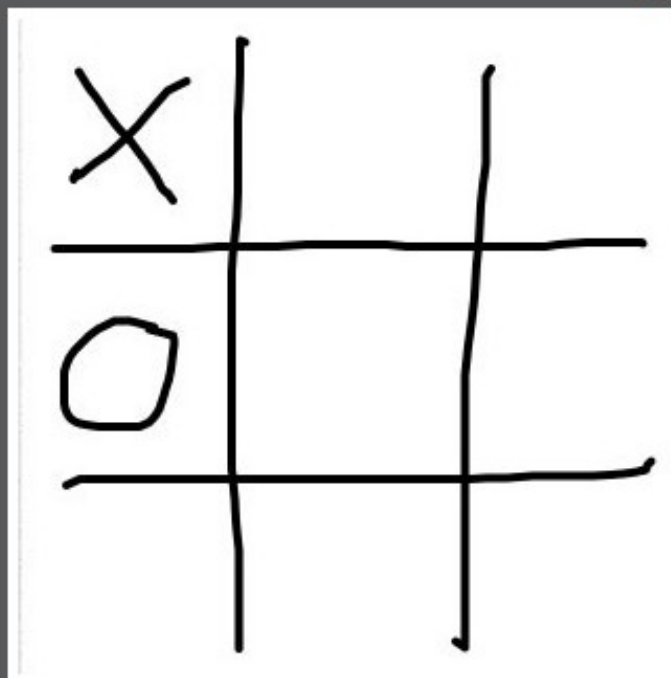
2

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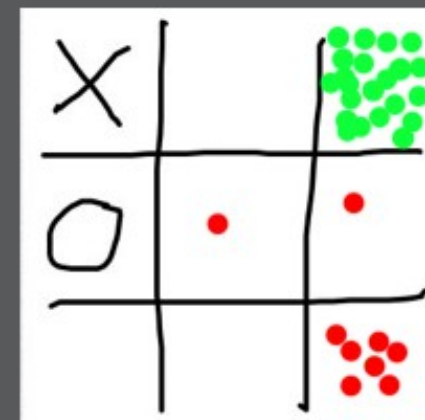


4. region It's X's turn -- what's the best next move?

[Stop delivery](#) [Deliver again](#) [Assign groups](#) [Show all results](#)

Round 1

31 responses, 71% correct



feedback & support

1 education

2 PI

3 PI 2.0

Sample question types:

- direction
- expression
- long answer, short answer, word cloud (fill in text)
- multiple-choice, many-choice
- numerical (enter a number)
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transformations of parabolas

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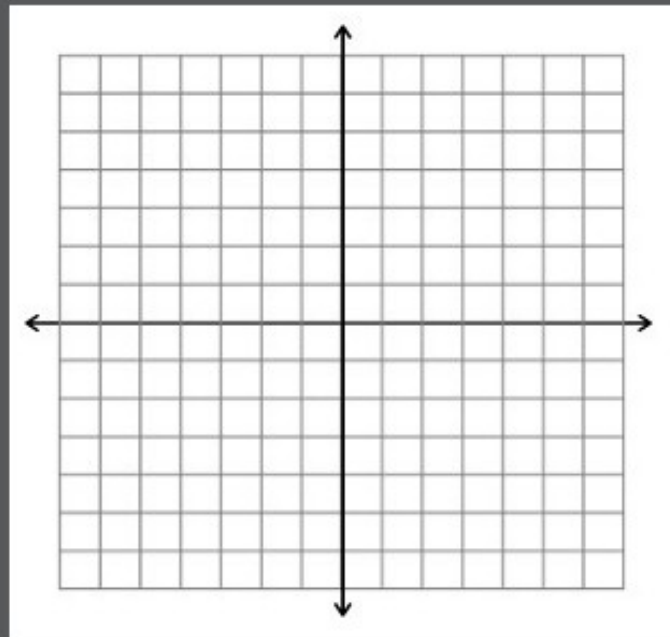
Jump to ▼

1

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**4.** sketch Sketch a graph of the function $f(x) = (x - 3)^2 + 2$.[Stop delivery](#) [Deliver again](#) [Assign groups](#) [Show all results](#)**1** education**2** PI**3** PI 2.0

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transformations of parabolas

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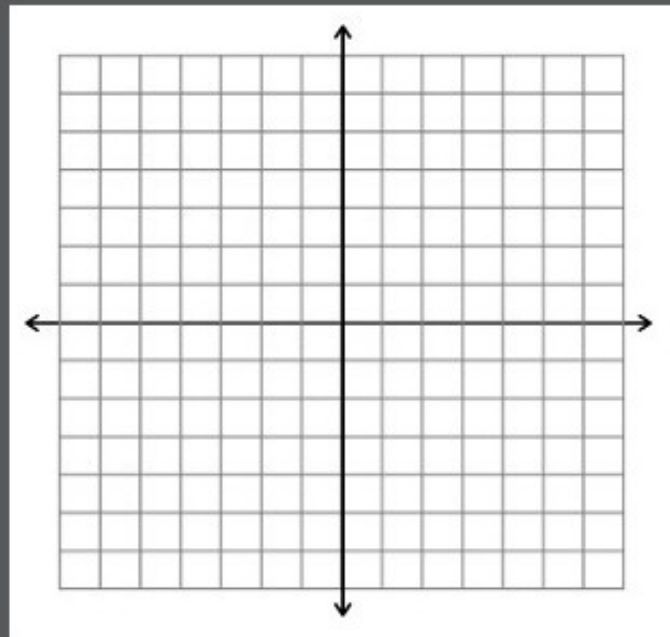
Jump to ▼

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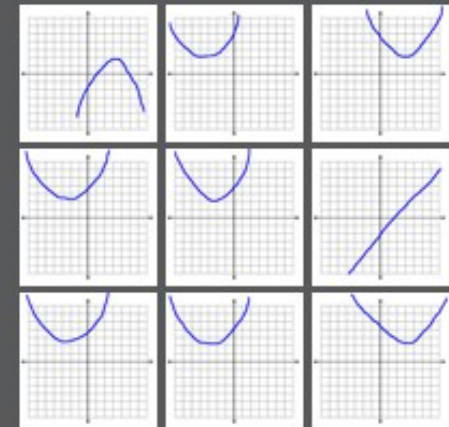
3

4

4. sketch Sketch a graph of the function $f(x) = (x - 3)^2 + 2$.[Stop delivery](#) [Deliver again](#) [Assign groups](#) [Show all results](#)

Round 1

9 responses



1 education

2 PI

3 PI 2.0

Sample question types:

- direction
- expression
- long answer, short answer, word cloud (fill in text)
- multiple choice, many choice
- numerical (enter a number)
- ranking
- region (select point on image)
- sketch



1 lecture

2 PI

3 PI 2.0



human interaction

1 lecture

2 PI

3 PI 2.0

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A positively charged rod is held near a neutral conducting sphere as illustrated below. A positively charged particle is moved from point A to point B as illustrated below.



Round 1 74 responses, 61% correct

A. 61%
B. 4%
C. 35%
D. 0%
E. 0%

Round 2 75 responses, 83% correct

A. 83%
B. 0%
C. 17%
D. 0%
E. 0%

A. positive
B. zero
C. negative
D. depends on the path taken from A to B
E. cannot be determined without knowing more about the polarization induced in the sphere

Search:

1 lecture

2 PI

3 PI 2.0

Carrier 100%

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A positively charged rod is held near a neutral conducting sphere as illustrated below. A positively charged particle is moved from point A to point B at constant speed. The potential difference from A to B is

A. positive
B. zero
C. negative
D. depends on the path taken from A to B
E. cannot be determined without knowing more about the polarization induced in the sphere

Round 1
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A. 61%	
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E. 0%	

Round 2
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E. 0%	

Search:

1 lecture

2 PI

3 PI 2.0

Carrier 9:31 PM 100%

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1 lecture

2 PI

3 PI 2.0

Carrier 100%

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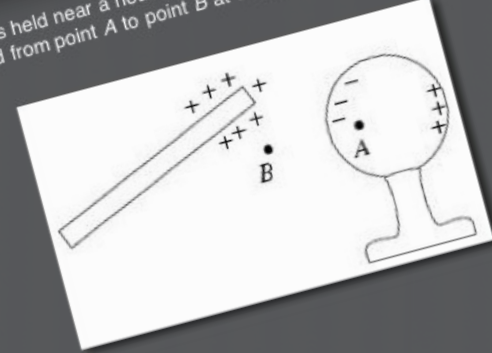
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B. zero
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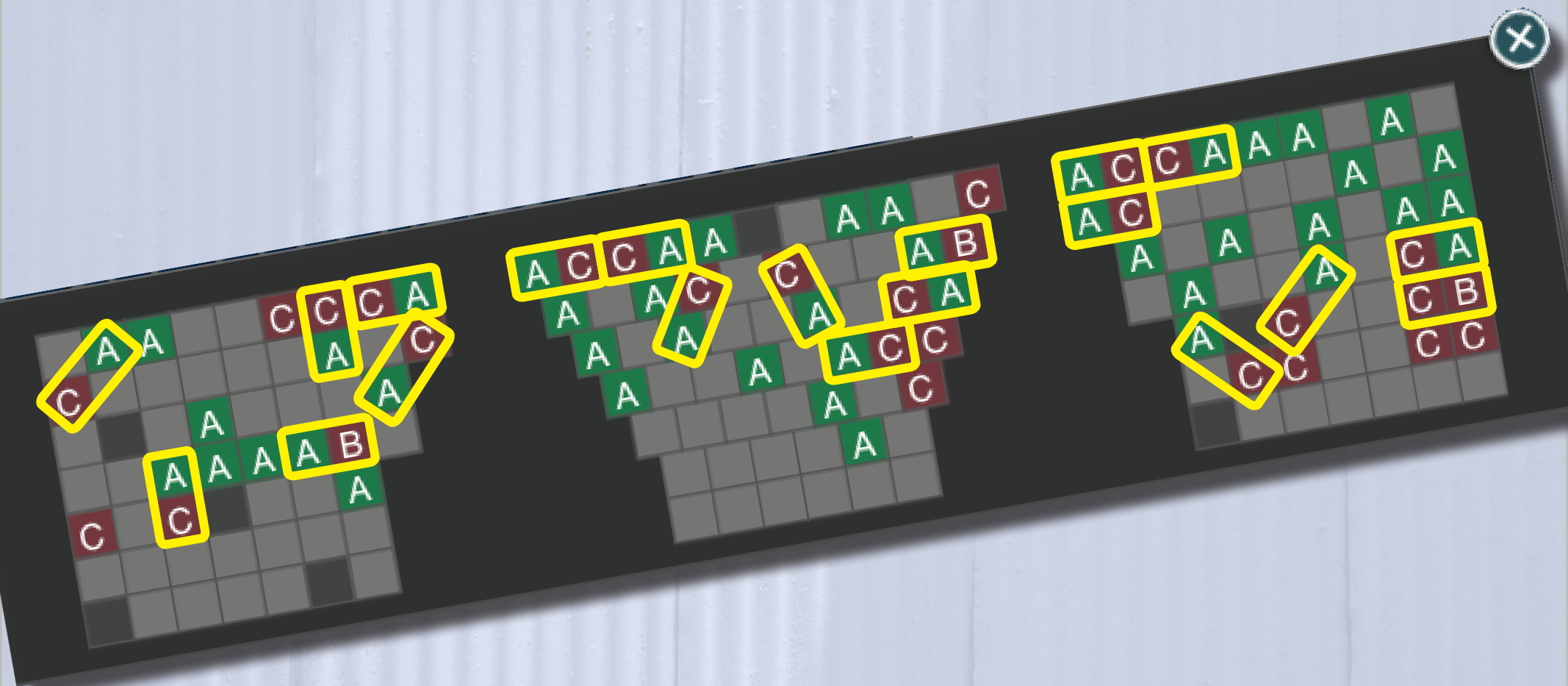
Search:

1 lecture

2 PI

3 PI 2.0

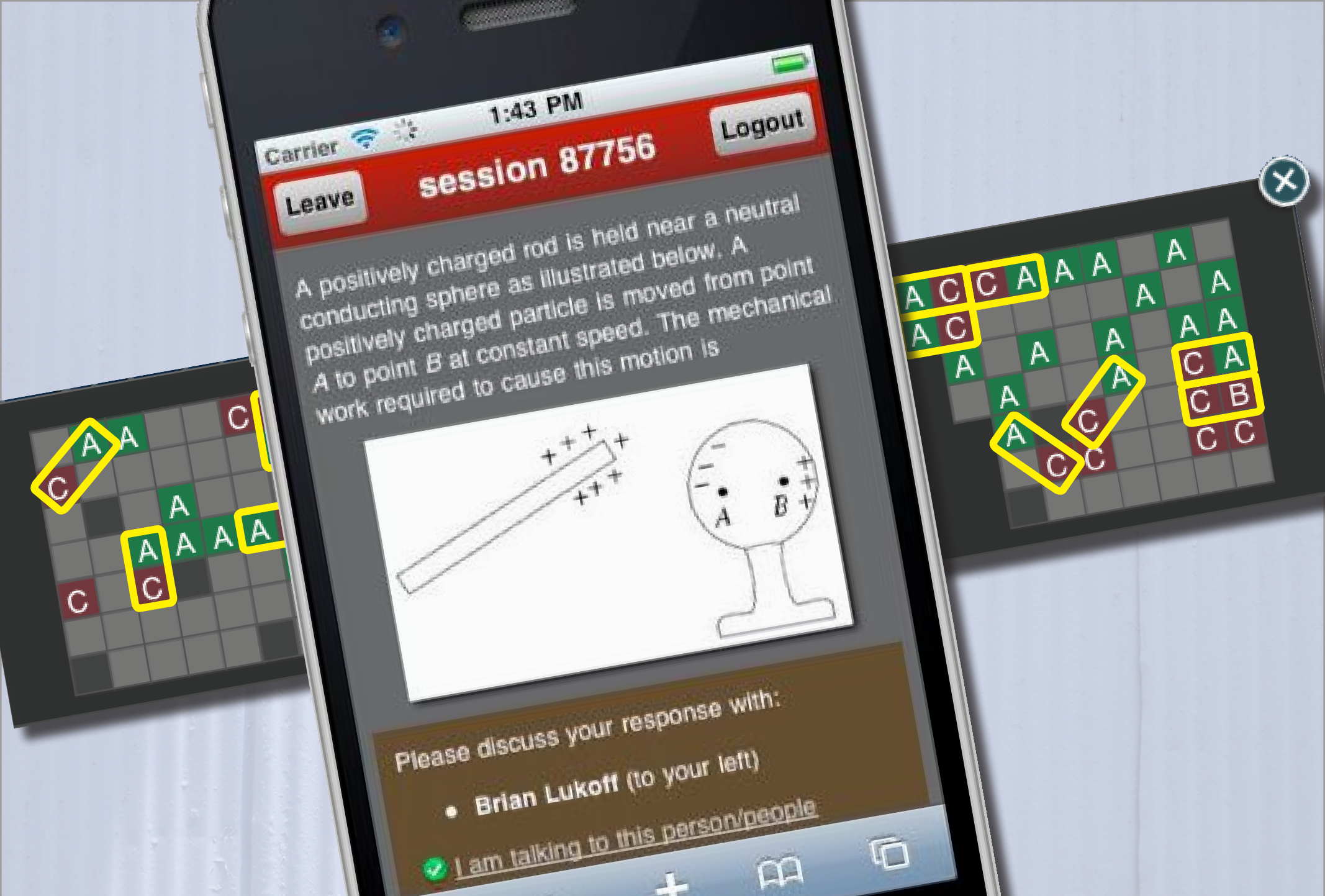
let system manage pairing



1 lecture

2 PI

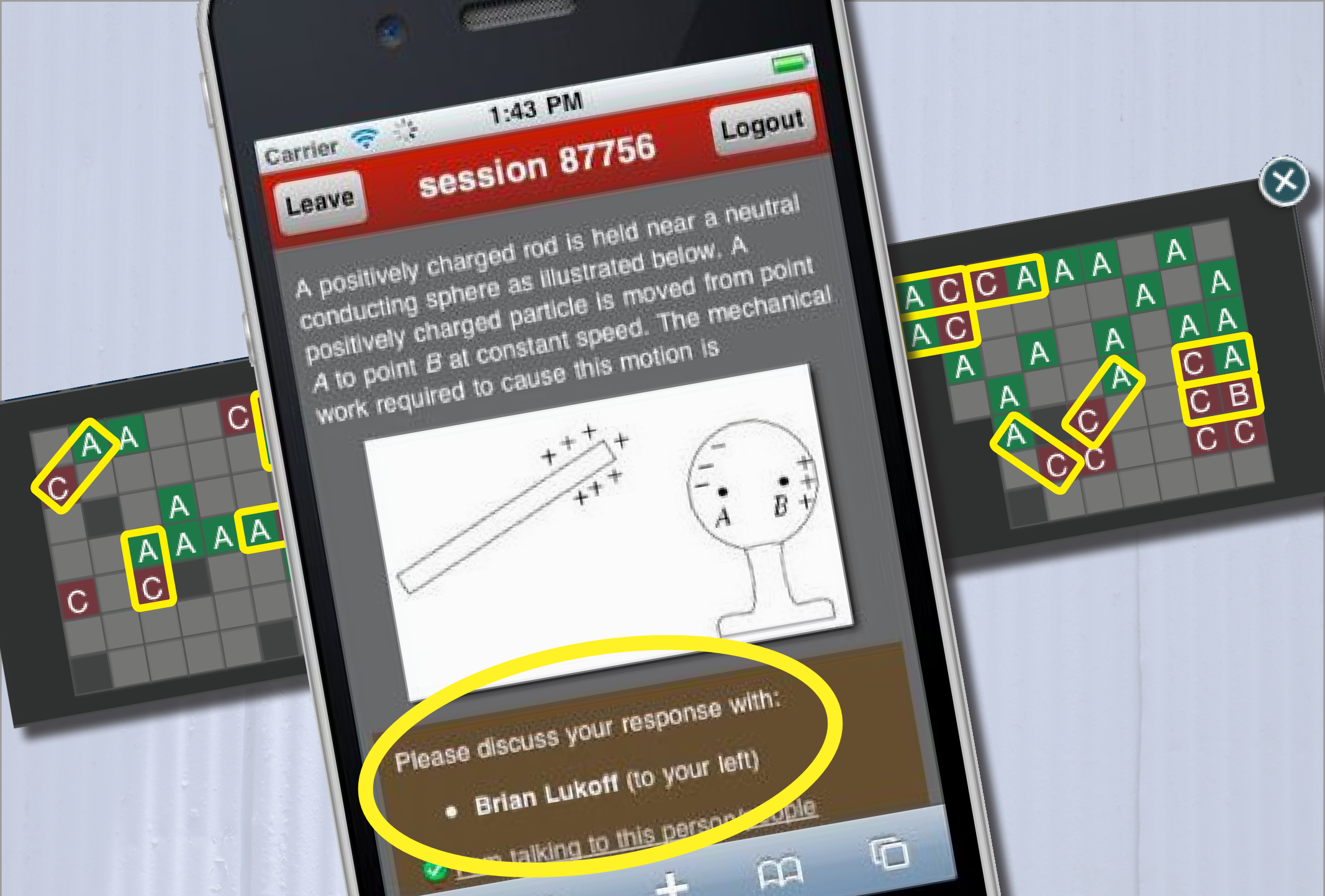
3 PI 2.0



1 lecture

2 PI

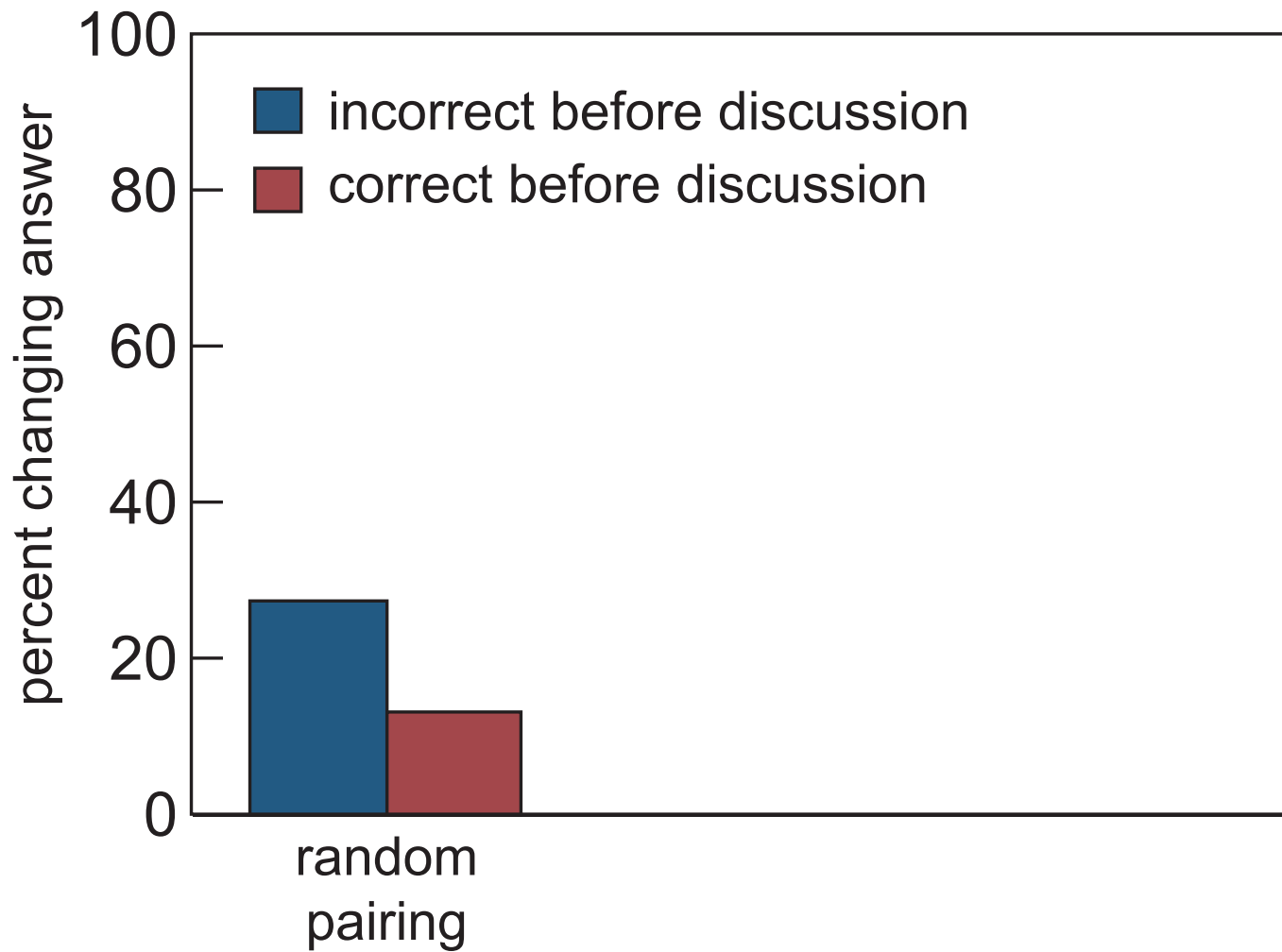
3 PI 2.0

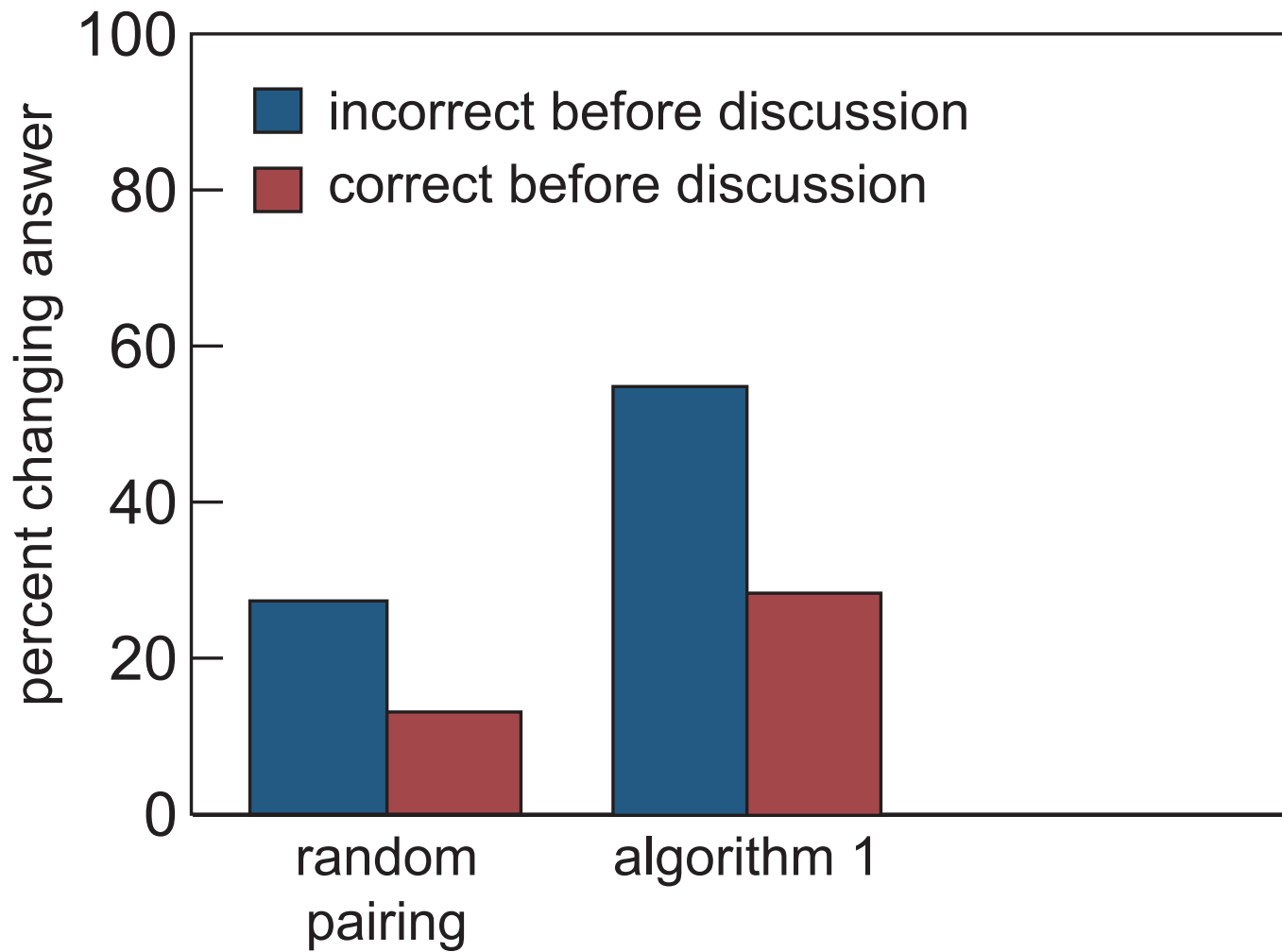


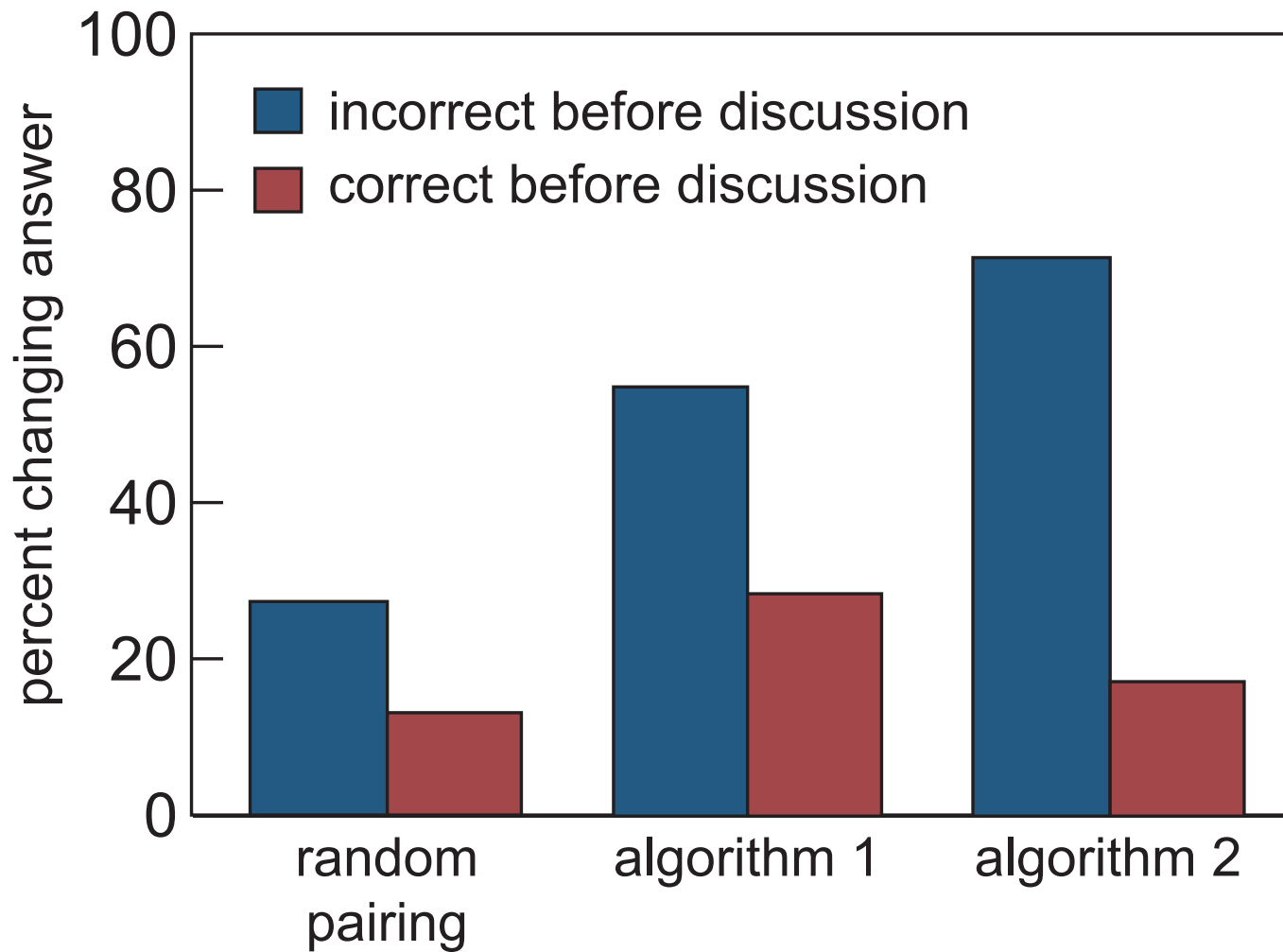
1 lecture

2 PI

3 PI 2.0









1 education

2 PI

3 PI 2.0



the future is here!

1 education

2 PI

3 PI 2.0



Education is not just about:

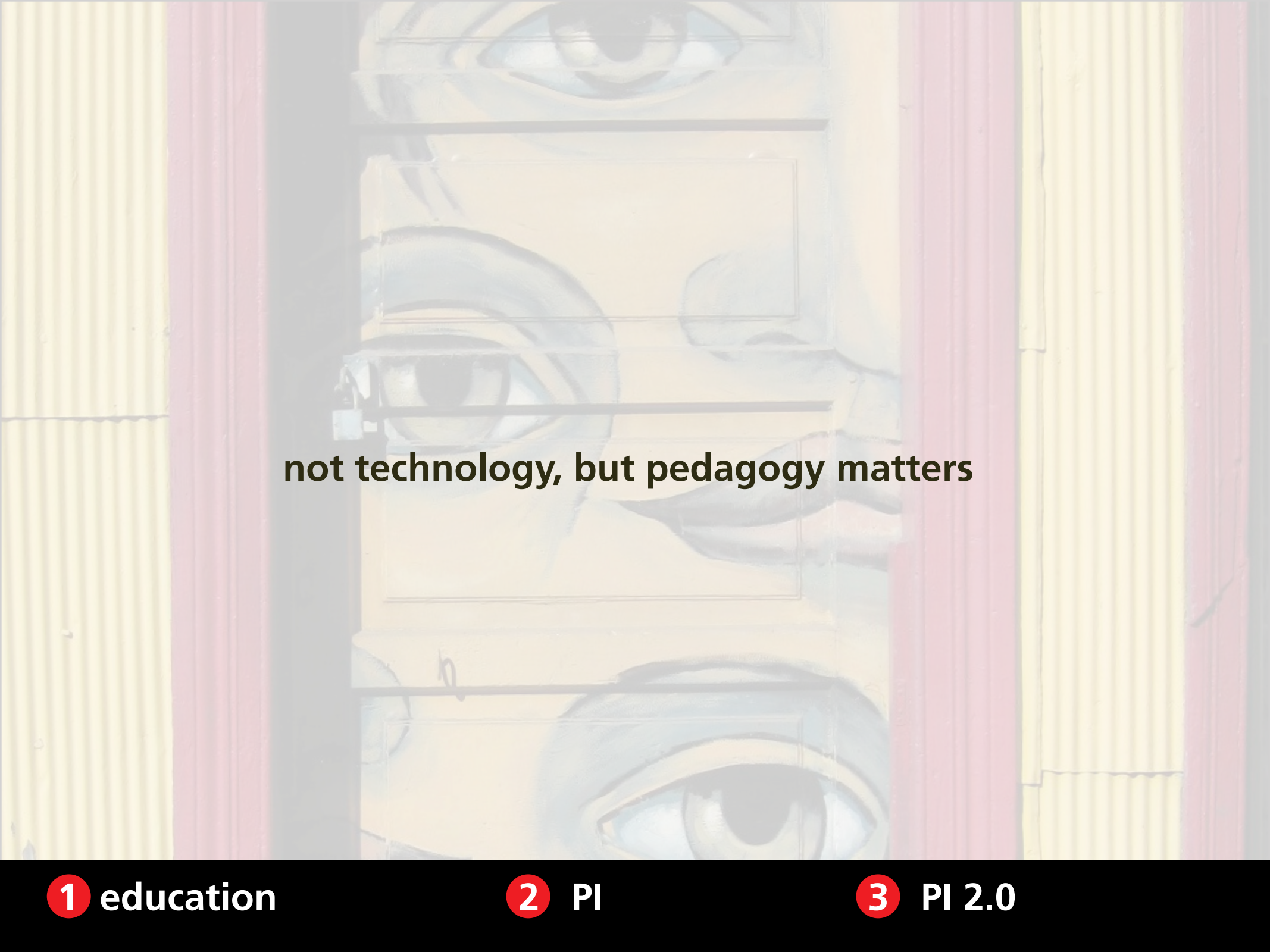
- **transferring information**
- **getting students to do what we do**



Education is not just about:

- **transferring information**
- **getting students to do what we do**

discovery & exploration a must!

The background of the slide features a close-up of a person's face, specifically their eyes and nose, viewed through horizontal window blinds. The blinds are partially open, creating a striped pattern of light and shadow across the face. The colors are muted, with a mix of greys, blues, and browns.

not technology, but pedagogy matters

1 education

2 PI

3 PI 2.0

Funding:

National Science Foundation

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